Hazard Elimination Project Evaluation

Order # 41000017683

Hazard Elimination Project W-4822

Evaluation of the Rumble Strip Installation
I-85 Business (US-29/52/70)
Davidson, Randolph & Guilford Counties

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Hazard Elimination Project Evaluation Documentation

Subject Location

Evaluation of Hazard Elimination Project Number W-4822 located along two different segments in Davidson, Randolph, and Guilford Counties, around the Cities of Lexington, Thomasville, and High Point for a total distance of 11.372 miles:

Segment 1 – Davidson County: I-85 Business from I-85 interchange to the Bridges over Swearing Creek (MP 0.50 – 2.75) – Total Distance of 1.25 miles

Segment 2 – Randolph & Guilford Counties: I-85 Business from the Davidson to the Guilford County Line in Forsyth County and to the northern I-85 interchange in Guilford County (Forsyth MP 0.00 – 1.622 / Guilford MP 0.00 – 8.50) – Total Distance 10.122 miles.

Location Map of Segment 1 from Google Maps

Location Map of Segment 2 from Google Maps

Project Information and Background from the Project File Folder

The hazard elimination project improvement chosen for the subject locations were the installation of milled rumble strips along the inside and outside shoulders of these roadway segments.

I-85 Business (also US-29/52/70 in parts) is a divided controlled access highway with constant median w-beam or cable barriers. There is a portion near the north end of Guilford County where two (2) signalized intersections and a couple crossovers are present. The lane configuration consists of 2 lanes per direction with acceleration and deceleration lanes near interchanges.

The paved median shoulder width is 4 feet and outside shoulder width is 10 feet for Segment-1. Segment-2 consists of a paved median shoulder width of 1.5 feet and outside shoulder width of 9 feet. The speed limit is a consistent 55-mph through both segments. The total countermeasure improvement distance is 11.372 miles.

The original statement of problem mentioned that vehicles were running off the road resulting in fatalities, serious injuries, and property damage. Lane departure crashes often result from fatigued or inattentive drivers. Rumble strips provide both noise and vibration as a warning to motorists that they are leaving the travel lane.

The initial crash analysis was completed from March 1, 2000 to March 1, 2003 with 191 reported crashes, with 71 crashes considered correctable Ran-Off Road collisions. The improvement was completed on June 30, 2006 with a total cost of $100,000. The projected B/C Ratio was 40.23.

Google Maps – Typical I-85 Business Roadway Segment

Naive Before and After Analysis

After reviewing the project file folder along with all the crashes along the subject segment, the crash data omitted from this analysis to consider for an adequate construction period were the months of April through June 2006. The before period consisted of reported crashes from December 1, 1999 through March 31, 2006 (6 years, 4 months); and the after period consisted of reported crashes from July 1, 2006 through October 31, 2012 (6 years, 4 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes along these segments with a zero (0) foot y-line (No Ramps). *Please see attached location map for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Freeway Lane Departure Crashes were the target crashes for the applied countermeasure. The Freeway Lane Departure Crash types considered are as follows: Angle; Fixed Object; Head-On; Jackknife; Overturn/Rollover; Parked Motor Vehicle; Ran-Off Roadway (Right, Left, Straight); and Sideswipe (Same and Opposite Direction).

Please note that Intersection Angle crashes at the signalized intersections were not considered as Lane Departure Target Crashes. All lane departure crashes were independently verified from the fiche analysis.

Treatment Information – Both Segments	**Before**	**After**	**Percent Reduction (-)/ Percent Increase (+)**
Total Crashes – Both Segments	426	417	- 2.1 %
Total Severity Index	7.12	5.89	- 17.3 %
LD Crashes – Both Segments	257	232	- 9.7 %
Lane Departure Severity Index	7.62	6.41	- 15.9 %

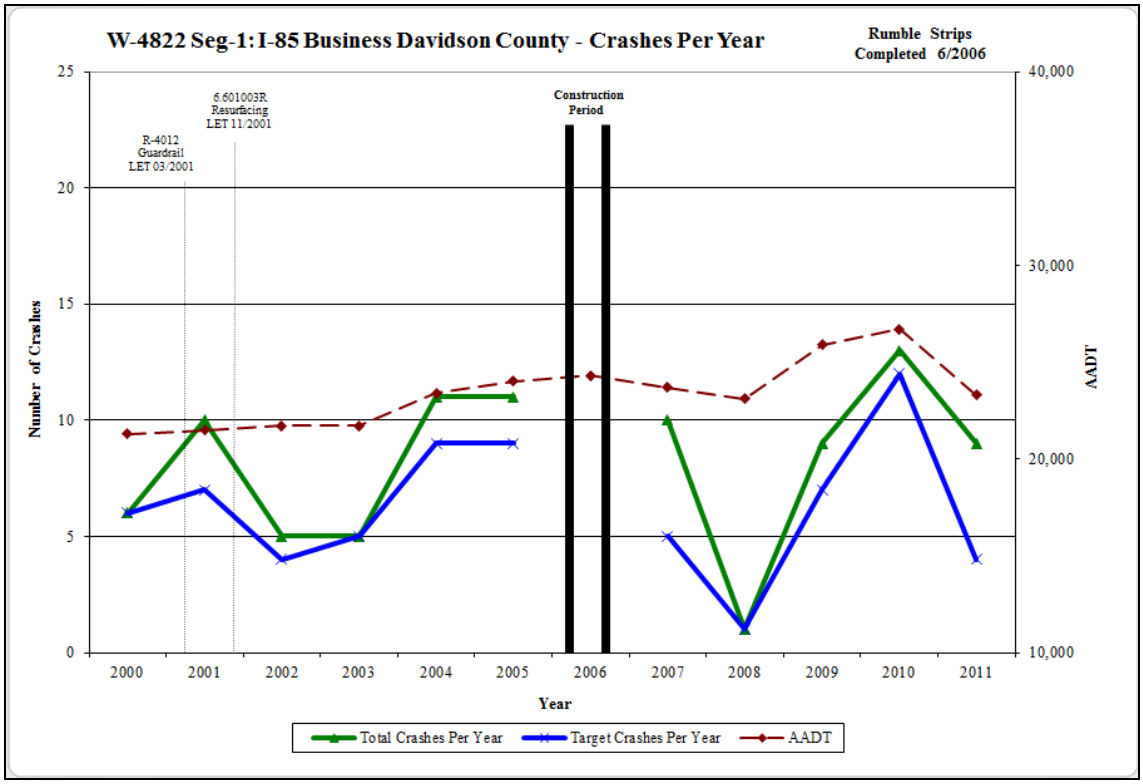
The following tables and charts examine the data by segment. Each segment is further displayed by direction and provided a chart of crashes per year that also list out other TIP projects that were discovered to have occurred on the route by LET date.

S1-Davidson: I-85 Business	**Before**	**After**	**Percent Reduction (-)/ Percent Increase (+)**
Total Crashes – Both Directions	49	51	4.1 %
Total Severity Index	4.96	5.39	8.7 %
LD Crashes – Both Directions	41	35	- 14.6 %
Lane Departure Severity Index	5.56	6.55	17.8 %
Volume (2003, 2009)	21,700	25,900	19.4 %
Total Crash Rate (100 Million Vehicle Miles)	43.39	37.80	- 12.9%
Injury Crashes			
Fatal Injury Crashes	0	1	100.0 %
Class-A Injury Crashes	1	0	- 100.0%
Class-B Injury Crashes	6	5	- 16.7 %
Class-C Injury Crashes	10	15	50.0 %
Property Damage Only Crashes	32	30	- 6.3 %
Contributing Factors			
Night Crashes	10	14	40.0 %
Animal Crashes	0	1	100.0 %
Wet Road Crashes	11	14	27.3 %
Alcohol / Drug Related	3	4	33.3 %

Seg-1: I-85B Northbound Only	**Before**	**After**	**Percent Reduction (-)/ Percent Increase (+)**
NB Total Crashes	28	25	- 10.7%
NB Total Severity Index	5.56	7.29	31.1 %
NB Lane Departure Crashes	24	16	- 33.3 %
NB Lane Departure Severity Index	6.32	9.44	49.4 %

Seg-1: I-85B Southbound Only	Before	After	Percent Reduction (-)/ Percent Increase (+)
SB Total Crashes	21	26	23.8 %
SB Total Severity Index	4.17	3.56	- 14.6 %
SB Lane Departure Crashes	17	19	11.8 %
SB Lane Departure Severity Index	4.48	4.12	- 8.0 %

Segment-1 experienced an increase of 4 percent in Total Crashes but a 15 percent reduction in Lane Departure Crashes. Contributing factors include a 40 percent increase in night crashes with a 27 percent increase in Wet Road crashes through the evaluation.



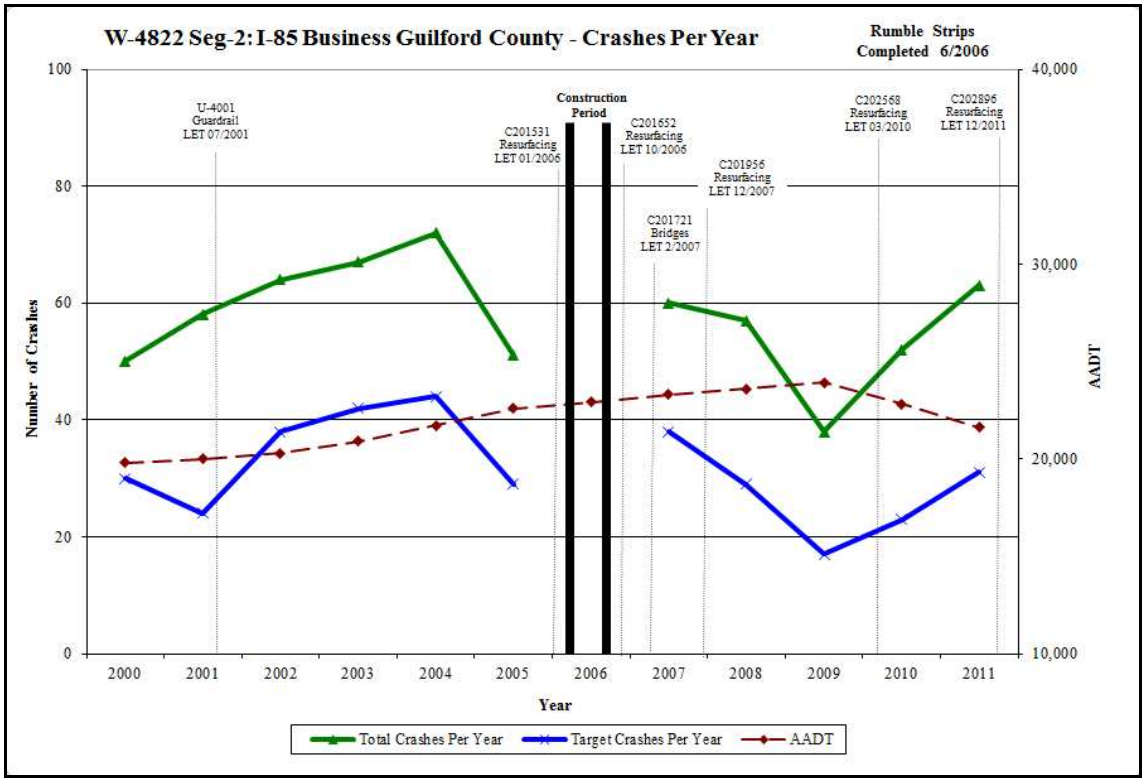
The previous chart depicts the number of Total and Target Crashes per year plotted in the before and after period, along with the AADT for this segment. Segment-1 total crashes per year saw fluctuation dramatically throughout the study with a severe drop during 2008. The TIP Letting website was searched for projects that were completed along this routes and two were discovered. However, the Safety Evaluation Group cannot conclude that other funds may have been used to complete construction, safety, or resurfacing projects along this roadway segment that may have affected crashes during the study periods.

S2-Randolph/Guilford: I-85 Bus	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes – Both Directions	377	366	- 2.9 %
Total Severity Index	7.40	5.96	- 19.5 %
LD Crashes – Both Directions	216	197	- 8.8 %
Lane Departure Severity Index	8.01	6.39	- 20.2 %
Volume (2003, 2009)	20,900	23,900	14.4 %
Total Crash Rate (100 Million Vehicle Miles)	77.05	65.35	- 15.2 %
Injury Crashes			
Fatal Injury Crashes	5	6	20.0 %
Class-A Injury Crashes	11	7	- 36.4 %
Class-B Injury Crashes	60	48	- 20.0 %
Class-C Injury Crashes	102	64	- 37.3 %
Property Damage Only Crashes	199	241	21.1 %
Contributing Factors			
Night Crashes	107	156	45.8 %
Animal Crashes	22	58	163.6 %
Wet Road Crashes	93	55	- 40.9 %
Alcohol / Drug Related	35	34	- 2.9 %

Seg-2: I-85B Northbound Only	Before	After	Percent Reduction (-)/ Percent Increase (+)
NB Total Crashes	211	202	- 4.3 %
NB Total Severity Index	7.67	5.60	- 27.0 %
NB Lane Departure Crashes	125	106	- 15.2 %
NB Lane Departure Severity Index	7.52	6.93	- 7.8 %

Seg-2: I-85B Southbound Only	Before	After	Percent Reduction (-)/ Percent Increase (+)
SB Total Crashes	166	164	- 1.2 %
SB Total Severity Index	7.05	6.40	- 9.2 %
SB Lane Departure Crashes	91	91	0.0 %
SB Lane Departure Severity Index	8.68	5.76	- 33.6 %

Segment-2 experienced a 3 percent reduction in Total Crashes and a 9 percent reduction in Lane Departure Crashes through the evaluation periods. The Total Severity Index reduced by 20 percent with a reduction in Severe Injury Crashes (Fatals and A-injury) from sixteen (16) to thirteen (13) from the before to the after periods. The largest benefit was observed in northbound lane departure crashes with a 15 percent reduction.



The previous chart depicts the number of Total and Target Crashes per year plotted in the before and after period, along with the AADT for this segment. Segment-2 total crashes per year appear to have increased steadily in the before period then starting a downward trend in 2005 through 2009. The after period crashes then started increasing again following the resurfacing in 2010. The lane departure target crashes follow the same patterns as the total crashes.

The TIP Letting website was searched for projects that were completed along these routes and seven (7) were discovered. However, the Safety Evaluation Group cannot conclude that other funds may have been used to complete construction, safety, or resurfacing projects along this roadway segment that may have affected crashes throughout the study period.

Results and Discussion

Reviewing the tables above, the combined segments overall experienced a reduction in crashes by 2 percent with a 10 percent reduction in Lane Departure collisions from the before to the after period. There was also a decrease in the Total Severity Index by 17 percent. Please see the previous tables for a breakdown of each segment individually.

The ADTs for both segments increased through the study with an increase of 15 percent on Segment-1 and a 14 percent increase on Segment-2. Severe injury crashes (Fatality and A-Injury) also reduced from seventeen (17) in the before period to fourteen (14) in the after period.

As the Safety Evaluation Group completes additional safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of treatment.